

Claims

1. A method of monitoring personnel operating at a workplace within a confined space, the method comprising:

providing a mobile workplace module comprising a video registration device producing video data, an audio interface for emitting and receiving audio data and a gas sensor to produce gas sensor data;

mounting the workplace module at least partially within the confined space;

providing a mobile monitoring unit outside the confined space, the monitoring unit comprising a display for displaying video data from the workplace module, an audio interface for emitting and receiving audio data and a gas data receiver for receiving gas sensor data;

connecting the workplace module to the monitoring unit for data transmission therebetween; and

monitoring at the monitoring unit the operation of personnel at the workplace.

2. The method according to claim 1, wherein the workplace module comprises a presence detector and the method further comprises detecting the presence of a person at the workplace.

3. The method according to claim 2, wherein the presence detector comprises a workplace access registration device and the method further comprises registering the entry and exit of personnel into the confined space.

4. The method according to claim 2 or claim 3, wherein the presence detector comprises an identification device and the method further comprises identifying the person at the workplace and providing the identity to the monitoring unit.

5. The method according to any preceding claim, further comprising providing a recording device and recording data transmitted to the monitoring unit.
6. The method according to any preceding claim, further comprising comparing gas sensor data with predefined gas data limits and generating a warning in the event that the gas data limits are exceeded.
7. The method according to any preceding claim, wherein the gas sensor is provided at the workplace.
8. The method according to any of claims 1 to 6, wherein the gas sensor is provided outside the confined space and gas at the workplace is transported to the gas sensor.
9. The method according to any preceding claim, wherein the video registration device is controllable from the mobile monitoring unit and the method further includes controlling the video registration device to zoom, pan or tilt.
10. The method according to any preceding claim, further comprising providing a second mobile workplace module at a second workplace; connecting the second workplace module to the monitoring unit for data transmission therebetween; and monitoring at the monitoring unit the operation of personnel at the second workplace.
11. The method according to claim 10 as dependent upon claim 7, wherein a second gas sensor is provided at the second workplaces.
12. The method according to claim 10 as dependent upon claim 8, wherein gas from the second workplace is transported to the gas sensor.

13. The method according to claim 12, wherein the gas sensor alternately senses gas from the first workplace and gas from the second workplace.
14. A safety monitoring system for monitoring of a workplace within a confined space, comprising:
 - a mobile workplace module comprising a video registration device producing video data, an audio interface for emitting and receiving audio data and a gas sensor producing gas sensor data; and
 - a mobile monitoring unit selectively connectable to the workplace module for data transmission between the workplace module and the monitoring unit, the monitoring unit comprising a display for displaying video data from the workplace module, an audio interface for emitting and receiving audio data and a gas data monitor for the gas sensor data.
15. The safety monitoring system according to claim 14, wherein the workplace module further comprises a presence detector for detecting the presence of a person at the workplace.
16. The safety monitoring system according to claim 15, wherein the presence detector comprises a workplace access registration device for registering the entry and exit of personnel into the workplace.
17. The safety monitoring system according to claim 15 or claim 16, wherein the presence detector provides identification data to the monitoring unit, identifying the person at the workplace.
18. The safety monitoring system according to claim 16 or claim 17, wherein the monitoring module has an active state and a passive state, and the presence detector

is active to cause transition of the monitoring module from the passive state to the active state in response to the detection of a person at the workplace.

19. The safety monitoring system according to any of claims 14 to 18, wherein the monitoring unit further comprises a recording device for recording data transmitted to the monitoring unit.

20. The safety monitoring system according to any of claims 14 to 19, wherein the gas data monitor compares gas sensor data with predefined gas data limits and generates a warning in the event that the gas data limits are exceeded.

21. The safety monitoring system according to any of claims 14 to 20, wherein the gas sensor is a direct gas sensor for location at the workplace.

22. The safety monitoring system according to any of claims 14 to 20, wherein the gas sensor is an indirect gas sensor for location at a distance from the workplace, the gas sensor comprising a gas delivery channel for transporting gas from the workplace to the gas sensor.

23. The safety monitoring system according to any of claims 14 to 22, further comprising a mobile umbilical cable for connecting the workplace module to the monitoring unit.

24. The safety monitoring system according to claim 23, wherein the mobile umbilical cable comprises an optical fibre for transmission of video data.

25. The safety monitoring system according to any of claims 14 to 24, wherein the workplace module comprises a plurality of video registration devices.

26. The safety monitoring system according to any of claims 14 to 25, comprising a plurality of workplace modules.

27. A petrochemical column in combination with a safety monitoring system according to any of claim 14 to 25, wherein the workplace module is located to monitor a workplace within an interior space of the petrochemical column.

28. A petrochemical column in combination with a safety monitoring system according to claim 16, wherein the workplace access registration device is located at a manhole opening to the petrochemical column for registration of entry of personnel into the column.

29. A workplace module for a safety monitoring system comprising a workplace unit and a plurality of sensors, the workplace unit comprising a plurality of data interfaces for receiving data from the sensors and transmitting data to the safety monitoring system, a plurality of power outlets for providing electrical power to the sensors and an isolation transformer for supplying the power outlets with low voltage electrical power.

30. A computer system for monitoring a plurality of confined workplaces comprising a monitor, a processing unit, and a plurality of video and gas data inputs associated with individual workplaces, the processing unit being programmed to compare the gas data inputs with predetermined reference values and cause display on the data monitor of gas data which exceeds the reference values together with further data related to the workplace associated with the displayed gas data.

31. The computer system according to claim 30, wherein the further data comprises the location of the workplace, a video image of the workplace or further gas data from the workplace.

32. The computer system according to claim 30 or claim 31, further comprising a memory containing the predetermined reference values and workplace location data.

33. The computer system according to any of claims 30 to 32, further comprising a plurality of worker registration inputs associated with the individual workplaces and the wherein further data is registration data related to the registration of workers at the workplaces.

34. The computer system according to claim 32 and claim 33, wherein the memory also contains worker data relating to individual workers and the further data comprises worker data.

35. The computer system according to any of claims 30 to 34 in combination with a safety monitoring system according to any of claims 14 to 26.